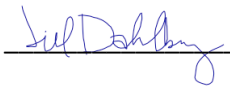
NASA ADVISORY COUNCIL

HELIOPHYSICS SUBCOMMITTEE

June 30 – July 1, 2015

NASA Headquarters
Washington, D.C.

MEETING MINUTES



Jill Dahlburg, Acting Vice Chair

Ramona Kessel, Executive Secretary

Table of Contents

Prepared by Elizabeth Sheley
Zantech IT

Tuesday, June 30, 2015

Welcome, Overview of Agenda

Dr. Jill Dahlburg, Acting Vice Chair of the Heliophysics Subcommittee (HPS) of the NASA Advisory Committee (NAC), opened the meeting by asking the Subcommittee members to introduce themselves. She next reviewed the agenda and announced the first speaker.

SMD Remarks/Introduction of New Heliophysics Director

Dr. John Grunsfeld, Associate Administrator of NASA's Science Mission Directorate (SMD), introduced Steven Clarke, the new Director of the Heliophysics Division (HPD). Mr. Clarke was previously the Director of the Joint Agency Satellite Division (JASD). Along with Deputy Division Director Ms. Sandra Smalley and Dr. Jeffrey Newmark, who led the Division as Interim Director, the HPD is in the hands of some excellent leaders.

Mr. Geoffrey Yoder, Deputy AA of SMD, spoke next, noting that he had previously addressed HPS in the spring to discuss the HPD director position. He explained that SMD leadership is extremely excited with the heliophysics team now in place.

Dr. Spiro Antiochos expressed concern, pointing out that at the previous meeting, HPS recommended that the next HPD director should be a heliophysics expert. The NAC Science Committee then confirmed this recommendation. The job entails advocacy of the field, and passion is key to advocacy. It is also required for decisions. Those not in the field may find it difficult to judge which voices deserve the greatest weight. He asked about the plan to have Division leadership come from the heliophysics field, given that Mr. Clarke and Ms. Smalley do not have that background.

Dr. Grunsfeld said that he did not disagree in principle. What matters is that the team be collaborative and transparent. HPD has a strong science team as well as good HPS membership. A higher priority for the director position was interacting with diverse stakeholders outside of heliophysics.

Mr. Clarke said that he is passionate about SMD and has been active in mission collaborations within and outside the Directorate. Similarly, although he is not a scientist, he is very passionate about science. He plans to rely on the HPD scientists and has asked Dr. Newmark to help advise him on science decisions. He is in the process of meeting with each individual on the heliophysics team to learn their perspectives on the challenges and needs facing the Division. He will also begin reaching out to the community in order to build a good coalition. He hopes to bring strengths to move forward on heliophysics objectives.

Heliophysics Division Overview

Mr. Clarke began the Division overview by noting that Dr. Newmark was a remarkable acting Division Director, and that Ms. Smalley has a strong grasp of the various programs.

Mission Update

The Magnetospheric Multiscale (MMS) mission was launched in March and will continue the commissioning phase through the end of August, becoming operational on September 1. The Space Environment Testbeds (SET) is set to launch in October 2016. Solar Probe Plus (SPP) is on track for a 2018 launch, and the Solar Orbiter Collaboration (SOC) with the European Space Agency (ESA) is scheduled to launch that same year. Pending Explorer missions include the Ionospheric Connection Explorer (ICON) and the Global-Scale Observations of the Limb and

Disk (GOLD), with planned launches in 2017 and 2018 respectively. HPD is working toward another Explorer Announcement of Opportunity (AO). Finally, the sounding rocket program had a successful launch the previous week.

The Heliophysics Space Observatory (HSO) has 18 missions in active operations, MMS in the commissioning phase, and 5 missions in development. The National Oceanic and Atmospheric Administration (NOAA) relies on a number of these assets. The recent Senior Review results had just been released to SMD; that, and flight program highlights, were on the HPS agenda for later.

The gyroscope on the Woods sounding rocket was installed wrong and the rocket had to be cut down. Otherwise the sounding rocket program has been going well. As part of that, the Wallops Flight Facility (WFF) has an innovative education program for students, teachers, and leadership for the sounding rocket program.

Science Highlights
The Ramaty High Energy Solar Spectroscopic Imager (RHESSI) detected an x-ray burst in a quiet area of the sun at an erupting filament. The Balloon Array for Radiation-belt Relativistic Electron Losses (BARREL) and Van Allen Probes showed how plasma waves cause particle precipitation. A new tool from the Goddard Space Flight Center (GSFC) has the potential to track space weather events up to 24 hours before they reach Earth. This could be a promising modelling development. A mid-level coronal mass ejection (CME) was captured by the Solar Dynamics Observatory SDO on June 20.

Research and Portfolio Balance
For the 2015 Research Opportunities in Space and Earth Sciences (ROSES) program, HPD will continue using the two-step process. The Division hopes this new process will streamline the reviews, and is interested in obtaining community feedback. The Fiscal Year 2016 (FY16) budget for HPD was reviewed at the March HPS meeting. At the time of the meeting, the President's Budget Request (PBR) was for $651 million, while the House had approved $641 million and the Senate figure was at $649 million. All of these amounts would meet Division needs.

Going forward, Mr. Clarke hopes to ensure a more balanced portfolio, a rebalanced staff workload, and a robust and long-term HSO and research programs. Regarding the staff workload, he has already reassigned part of the GOLD project and is still working on obtaining program scientist resources, possibly through detailees and Intergovernmental Personnel Act (IPA) employees. To develop and implement a long-term strategy for a balanced portfolio, he wants more frequent lower-cost missions through expansion of Explorer and Mission of Opportunity (MOO) calls.

Another area of focus is technology investment and, to that end, HPD will soon be bringing on a new program scientist to be the technology investment point-of-contact with NASA's Space Technology Mission Directorate (STMD). Mr. Clarke also hopes to enhance collaborations with other agencies, both domestic and international. Finally, he hopes to engage the heliophysics community, with the goal of hearing their ideas on objectives and strategies.

Discussion
Dr. Mihir Desai noted that goals do not always align among international and interagency partners. Mr. Clarke said that if HPD were to be pushed in a direction that does not meet Division objectives, he would push back. The objectives must be aligned in order to have a successful collaboration. When pooling resources, HPD must go in directions that make sense.

In response to a question, Mr. Clarke explained that when he refers to a "balanced portfolio," he is considering a number of factors, including platforms such as the International Space Station (ISS). There are also things on the periphery. The new program scientist for technology will have some focus on CubeSats, which could be cost-effective. Flagship missions take up most of a division's budget, so he would like to have the community's view of the importance of these missions. He does not expect that all four program lines within HPD will have even funding. He would also like to increase the cadence of the Explorer and MOO AOs.

Regarding opportunities for international and inter-agency collaboration in the area of space weather, Mr. Clarke said that there is potential in this area, particularly with NOAA. He has also spoken with representatives of the Department of Defense (DOD) about this.

Dr. Heather Elliott pointed out that a frequent comment is that the HPD budget looks bigger than it is, especially in research and analysis (R&A). The Division carries some costs for all of SMD. Dr. Ramona Kessel, HPS Executive Secretary, explained that some SMD activities are held in HPD. Dr. Desai added that the de facto budget is about $50 million less than the allocation. Mr. Clarke said that he is just now getting into the details of the budget allocations.

Dr. Desai asked about the impact on NASA when international partners drop their schedules. Mr. Clarke replied that HPD is engaged with ESA on instrument timelines and costs. If the ESA schedule were to slip, NASA would look at ways to minimize Agency costs. He has done this with other programs. The key is constant communication of these impacts with the international partners. Those interactions can be difficult, however.

Dr. Dahlburg asked if HPS might offer collaboration suggestions. She introduced as an example Solar C, a follow on to the Japanese Space Agency's (JAXA's) Solar A and Solar B missions. Solar C will enable tracking of dynamic solar events with consistent resolution from the sun's surface through the chromosphere and into the corona and will provide a greater ability to connect models. ESA would have to be involved as well. This has been in the planning stages for a while.

Dr. William Kent Tobiska added that one of the big space weather issues, which the previous week's CME highlighted, is getting the arrival time right. Measurements are key. There are techniques that hold promise, like interplanetary scintillation of distant radio sources. Developing additional instrumentation would help scientists to understand arrival time. Dr. Lika Guhathakurta of NASA said that there has been international discussion of this topic. Dr. Antiochos noted that it is often difficult to develop instrumentation for pure science goals on a small scale. However, creative thinking to combine science needs and new technologies might be something HPD could sell on both the science and technology development sides.

Dr. Vassilis Angelopoulos explained that HPD and the National Science Foundation (NSF) Geospace Program share many interests and goals. However, the NSF Geospace Program is being cut back and would benefit tremendously from a partnership with NASA, both financially and as a vote of confidence from NASA. Mr. Clarke said that he has spoken with NSF about having discussions along these lines, specifically in terms of using NSF ground assets.

Dr. Michael Liemohn said that Los Alamos flies magnetospheric physics satellites, which are hard to access due to security issues. However, it might be worth having discussions with the facility. Dr. Elliott added that in working with the New Horizons mission, she has learned that certain instruments get turned off at various points. HPD could use that time. Dr. Dahlburg noted that the Fermi mission could also be synergistic. Dr. Tobiska said that DOD, and the Air Force in

particular, has a strong database. There are some access issues, but DOD recognizes that the community might find use for the information. Dr. Bart De Pontieu suggested that NASA could help NSF develop the expertise needed for a telescope the Foundation is building to study the chromosphere, expected to launch in 2019.

Dr. Desai said that his concerns about collaboration remain. Other agencies and partners have different goals. HPD should differentiate what it has and not jump on their bandwagons. Dr. Antiochos countered that the history of the Division shows that international missions have had enormous success. HPD should be aware of potential issues, but the advantages are enormous. Dr. Desai suggested that HPS be given a list of the collaborations that might come up as MOOs.

CubeSats

Dr. Newmark addressed HPS on the subject of CubeSats, which are a frequent meeting topic. The community should know what HPD is funding in this area, and how it applies to heliophysics. The Electron Losses and Fields Investigation (ELFIN) CubeSat mission will explore the mechanisms responsible for the loss of relativistic electrons from Earth's radiation belts. This is a collaboration with NSF, expected to launch in a couple of years. The Compact Radiation Belt Explorer (CeRES) is the first CubeSat fully funded by NASA. It is expected to launch in late 2016 and will examine electron loss due to microbursts.

The CubeSat mission to study Solar Particles over the Earth's Poles (CuSPP) has been redefined and expanded, and is now CuSPP+. It will provide a good test for telemetry in future deep space missions. The Tandem Beach Explorer (TBEx) will address proof-of-principle, first-time science recommended in the Decadal Survey (DS) in order to provide a better understanding of the physics that controls the day-to-day variability in development of space weather. The Scintillation Observations and Response of the Ionosphere to Electrodynamics (SORTIE) mission will help discover the sources of wave-like plasma perturbations in the ionosphere.

Many of these missions fly in the same time period and thus provide comparison opportunities. However, the DOD Communications/Navigation Outage Forecasting System (C/NOFS) mission will be de-orbited in about a year. While SORTIE will continue that science, the two missions will not be operating at the same time. The Miniature X-ray Solar Spectrometer (MinXSS) science was tested on a sounding rocket and will next go up on a CubeSat. This studies at solar flares and solar x-ray input to the ionosphere and spectral irradiance.

Multiple CubeSats may communicate to each other, the ground, and another spacecraft. Dr. Neil Murphy said that one goal is communication between CubeSats. The University of Michigan is working on constellation communication. Dr. Dalhburg commented that she understood this to be complex, especially for low-Earth orbit (LEO). Once that has been mastered, it will be possible to add CubeSats to constellations. Dr. Jeffrey Hayes said that NASA's Space Communication and Navigation (SCAN) Program is just now starting to think about that. The science must drive this, and the engineering community will follow.

Dr. Antiochos pointed out that CubeSats are delivering more and more of the basic science observations. He asked how to enable community access to these observations. Dr. Hayes said that NASA is working on a policy for sharing the low-cost asset information, such as that from sounding rockets. However, the data must be usable. This leads to questions about additional requirements being placed on principle investigators (PIs) and the funding for those requirements.

Dr. Arik Posner said that ROSES requires data management and archiving going forward. Dr. Guhathakurta noted that she will be going on a detail to look at CubeSats and system science,

including how to create a portfolio to use CubeSats in system science. Dr. Newmark added that SMD is also looking at how CubeSats, smallsats, and even nanosats might integrate with NASA science objectives. Dr. Hayes said that he is trying to determine how to take less-than-perfect data and make it accessible. This will require standards. Archiving is a lot more expensive than people think, and it has to last.

Flight Program Status

Ms. Smalley began her discussion by addressing two topics that were discussed earlier in the meting. She clarified that specific timelines for future Explorers are dependent on what the community proposes. Timeframes provided in the presentation are notional. Secondly, in response to the earlier budget discussion she explained the HPD manages the sounding rocket program for all of SMD. Similarly, SMD manages certain Directorate-wide programs in other divisions. For example, the Astrophysics Division (APD) manages the balloon program for all of SMD.

Ms. Smalley provided a status of all missions in development. MMS is doing quite well. The mission is the planning a post-launch assessment (PLAR) review in order to transition to prime operations. The booms and probes are deployed, and the software uploads are complete. There was a slight anomaly with the axial double probe, but it has no impact on the science. The Living with a Star (LWS) SET-1 is scheduled to launch in 2016; all flight hardware has been delivered and it is on schedule. ICON is proceeding well and has passed a number of reviews. Concerns include coating delamination issues and a low turret resonance frequency that does not meet requirements. GOLD is technically on track, but integrated cost and schedule plans require revision.. This plan is required in order to evaluate performance. Therefore, the critical design review (CDR) has been delayed. The team is continuing with subsystem designst. Ms. Smalley expected to have an update for the next HPS meeting. SPP completed critical design review (CDR) in March. There is some potential for cost growth, as a replan was needed for the Solar Wind Electrons, Alpha and Protons (SWEAP) instrument. There was a load issue that has been resolved, but it calls for some design work that affects the cost. NASA is providing two instruments for ESA's Solar Orbiter, which is scheduled to launch in late 2018. ESA has had scheduling, systems engineering, and integration issues, along with concerns about the high voltage opto-diode. The high-voltage discharge failure review board is underway. The plan is to rebuild and test those boards.

The "stoplight chart" of HPD missions in formulation and development showed almost everything in green, indicating that the missions are on plan. The few yellow elements are being resolved within margin.

The sounding rockets program is quite active. The Explorer and Solar Terrestrial Probes (STP) AOs are also pending. On NASA's Strategic Objectives Alignment Review (SOAR), HPD was recommended by NASA for the rating of "noteworthy progress", which is a rare honor within the Agency and a measure of the Division's strength. SOAR comprises a set of performance metrics that evaluate science and programmatics. Mr. Clarke added that SOAR is a factor in the OMB evaluations of the Agency; this rating can be used in advocating HPD's work.

Dr. Tobiska observed that the programs Ms. Smalley had described were all at high technology readiness levels (TRLs). He described a successful mid-TRL development program out of NASA Langley that has been highly successful, and noted that HPD could gain additional leverage by getting involved in this kind of thing. Ms. Smalley said that this might be something to examine in terms of intra- and inter-agency synergies that could advance the science.

The sounding rocket program is unable to launch out of Australia until 2017 due to the state of negotiations with the Australian government. The Peregrine motor development failure investigation did not turn up an obvious cause. It is an important activity and HPD is looking at how to move forward.

For the Solar TErrestrial RElations Observatory (STEREO), STEREO A produced some strong telemetry, but STEREO B is still silent. The mission team will try once more to re-activate STEREO B in November.

NASA will no longer support Cluster after FY15, so HPD will stop reporting the mission as part of the mission suite. The C/NOFS mission will re-enter in 2016. The Discover mission is still going through commissioning and has not yet been turned over to NOAA. The Earth Sciences Division (ESD) has some involvement in that mission.

Senior Review Results

Dr. Hayes discussed the recent Senior Review, which is a comparative review of missions past their prime phase. Fifteen missions came to the Review, and HPD is extending all of them. The most significant finding is that there is a need for more budget detail from the missions; the programs will work with the missions on that. The official letters were to go out that same day.

Dr. Ralph McNutt wondered about the funds to keep the 15 missions operating. Dr. Hayes explained that he briefed Dr. Grunsfeld the previous Friday. The budget for extended missions is thin. There are 15 missions doing phenomenal science with a combined budget of under $100 million, which is less than the cost of one astrophysics mission. Dr. Hayes believes that is too little, but it allows a defense of the portfolio. The questions then become how to grow the portfolio, how to parlay the system into more support, and how to make the layperson care? HPD's ability to articulate why the taxpayer should care is key.

Dr. Antiochos observed that so many missions go way beyond their nominal lifetime. He wondered if this might indicate that the NASA quality control requirements are overkill and cost too much. He wondered if standards might be altered in order to save money on mission development. Dr. Hayes replied that missions tend to die early or last indefinitely. Mr. Clarke said that robustness is key. A total loss has great impact on the science community. Longer term assets influence mission planning and technology maturation. Dr. Tobiska added that some of these extensions have allowed the community to serve a broader audience, along with other agencies. The fact that NASA spacecraft have excellent quality and duration means that they constitute a national asset to bring the entire space weather enterprise forward.

Dr. James Russell III disagreed with Dr. Antiochos, stating that the only way to reduce the cost is to lower the class. After the initial mission, the science per dollar goes way up. Dr. Hayes used the example of STEREO, which was designed for a 3-year prime mission. If he were to over-engineer to get through the energy focus issues that arose, the mission would have cost another $50-100 million and would not have been funded. Dr. Antiochos said that NASA could have built two or three missions for that cost. Dr. Hayes said that the issue is risk aversion. Dr. Dahlburg pointed out that launch costs have doubled, and suggested this as a topic for further discussion.

Solar Cycle Prediction, Short-Term Solar Variability, and the Measurable Effects of That Variability throughout the Heliosphere

Dr. Robert Leamon gave a science presentation on long- and short-term solar variability throughout the heliosphere. He explained that the two hemispheres of the sun are very different from each other. While sunspots are a crude proxy of solar variability, they have been tracked

since the 1800s, which has allowed scientists to determine their cycles. The big question is how the internal magnetic machine of the sun produces the decadal, annual, and shorter-term solar variability. Another question is whether investigators can observe these processes well enough to produce a reliable forecast of solar activity.

The sunspot number (SSN) provides a measure of asymmetry, which is more common than symmetry. Solar and Heliospheric Observatory (SOHO) measurements indicate that the change is in the heliosphere, not on Earth, and tracks the cosmic ray flux (CRF) rather closely. Data from 2009 indicate that small and large-scale magnetism are affected in tandem. Total solar irradiance (TSI) hit an unprecedented low. The brightpoint (BP) tracks appear to have no structure, though they have a preferred location and spatial scale. Refining by color scale offers more precision and shows the magnetic range of influence.

Dr. Leamon described the tracking of BPs, noting that new diagnostics provide additional insight, while merging BP and granular node information allows identification of bands of activity over time. These lines drop in slope about 2-3 degrees per year, are similar over time, and can be tied to the solar cycle plot. Analysis of sunspot areas back through 1875 shows consistent bands. The lead and lag of the hemispheres and their phasing affects the decadal variation in flux distribution on the solar disk. This, in turn, affects plasma energetics on small scales and things like the CRF on the large scale. As the cycles slow, the flux weakens, but then there is a cluster.

Dr. Antiochos pointed out that the information was all statistical, with no physical model. He was concerned about predicting future activity based on past data, and he tends to be skeptical of these models. Dr. Leamon said that there are observational constraints. Regarding large convection cells, those will play into the larger picture for seasons. He provided graphics of surges of surface magnetism, which he believes to be the roots of strong episodic variability. It shows the space climate, which leads to the space weather component.

In summary, BPs provide an observable surface marker of deeply rooted magnetic activity in the sun. Observing them helps scientists to explain:

- The progression of the sun's 22-year activity cycle via its activity bands;
- The envelope of decadal solar variability through the slowing of the activity bands' equatorial migration;
- The periodic instability in the bands that give rise to quasi-annual surges in magnetic field emergence;
- Profoundly complex sunspot configurations due to band interaction between cycles and hemispheres; and
- Space weather forecasting with months of lead time.

Staffing Needs of HPD

Mr. Clarke explained that his management team is looking across HPD and doing both a gap analysis and a workload analysis to determine if adjustments are needed. He has already shifted the GOLD project workload. To avoid excessively late hours, he is streamlining the management team process in order to allow more time for strategizing. Civil service slots are hard to come by, as there are ceilings. However, he can bring in detailees and Intergovernmental Personnel Act employees (IPAs). He will have more to say about this at the next HPS meeting.

HPS Discussion

Dr. Dahlburg noted three possible topics for findings arising from the HPS discussion on the topic of mission risks and risk aversion, following Dr. Hayes' briefing: fixed launch costs; programmatics costs; and hardware class. Dr. Russell raised the associated issue of reviews,

which are expensive and cumbersome. In addition, the number of mission reviews has become excessive. He believes this might be due to an interpretation of the NASA Procedural Requirements (NPR) document 7120, and he was not convinced that the interpretation was accurate. In addition, the "informal" reviews are now actually formal, requiring responses and follow-ups. Dr. Angelopoulos added that comments from ongoing mission investigators indicate that they are receiving more scrutiny than in the past. HPS might recommend trying to document this.

Mr. Clarke pointed out that launch vehicle costs are beyond HPD control. Dr. Posner added that reducing these costs would help HPD. He suggested asking partners to contribute to launch costs. Dr. Tobiska noted that the public does not understand the reasons for outsourcing launch elements; NASA should get that message out.

Dr. Angelopoulos said that the previous HPS meeting generated a recommendation about enabling secondary missions. Dr. Maura Hagan, the former HPS Chair, took this to the NAC Science Committee, which indicated that this activity was already being done. He wanted to learn more about that. Dr. Newmark explained that the Science Committee did not take this recommendation forward because they felt that the payload adaptor fittings (PAFs) example was very specific, and they felt that the AOs allow for secondary payloads already. APD uses them, for example. The Committee determined that it was already an option. Dr. Dalhburg commented that the recommendation might have needed additional clarity. She suggested refining it. She asked Dr. Angelopoulos to identify some examples.

R&A Program Update/ Heliophysics Technology and Instrument Development for Science (HTIDeS)

Dr. Jeff Morrill explained that HTIDeS combines technology elements from solar, heliosphere, and geospace science supporting research and technology (R&T) programs. It involves low-cost access to space (LCAS), instrument and technology development (ITD), and Laboratory Nuclear, Atomic, and Plasma Physics (LNAPP). As part of HTIDeS 2014/LCAS for geospace and solar/heliophysics, the program selected five rockets and two balloons. The ITD for geospace and solar/heliophysics chose two rockets and one balloon, while LNAPP had two lab studies. The reviews did not have an encourage/discourage decision in Step 1.

Dr. Posner described the ROSES 15/16 funding situation as bleak. The program has a $5 million augmentation to spend on ROSES 14, and there are multi-year projects. He expects a 13 percent selection rate across the three areas. For Step 1, there were 345 Supporting Research (SR) submissions, 206 Guest Investigator (GI) proposals, and 133 HTIDeS proposals. Dr. Leamon noted that HPD encourages a range of focused topics each year. For the last couple of years, the program has encouraged larger scale proposals. Dr. Posner said that the ROSES 17 acceptance rate is expected to increase, and ROSES 16 will solicit the theory program. The latter will be funded at $4 million. There are opportunities for synergies with NSF. Dr. Morrill added that a paper on Federal funding of astronomers and other scientists shows that for a roughly 20 percent success rate, proposers will survive about 3 years before leaving the field.

HPS Discussion/Working Time to Develop Findings

Dr. Dahlburg listed travel restrictions, the theory program, and collaboration as some topics for discussion. Dr. De Pontieu said that the community is concerned about the quality of the refereeing of the proposals, per which one idea could be to split proposals into two groups that would then review each other.

Travel

Dr. McNutt said that anyone who has tried to travel on a NASA supporting contract knows about the restrictions, which arose in 2013. Some of this has been relaxed by OMB. However, NASA is maintaining the strict definitions internally. The original restrictions go back to an OMB 2012 requirement that agencies track travel. There was a limit on expenditures and a limitation on travel and the number of employees who could travel to a given meeting. The definition of a NASA employee is either a civil servant or someone paid by NASA under the IPA structure. A lot of the strictures have been changed and an interim directive was signed into effect last October. There is some clarifying language in that, especially regarding contractors and their travel. There is also some information about how the contracting needs to be done.

Those currently administering the NASA Contract Tracking System (NTCS) are still including contractors in the 50-head limit for foreign travel. This issue went to the NAC. NASA Administrator Charles Bolden then said that the guidance had all changed. However, problems persist, especially at NASA's Jet Propulsion Lab (JPL). Those administering NTCS are still counting contractors against the total number, and otherwise administering NTCS to limit travel in ways they should not. Last week, a Mr. Wood or Woods said that there was not a problem. But this is continuing to be an incredible strain on the community. NASA is enforcing this as a gate for deciding whether people can attend conferences, and the Agency is pretending that contractors cannot go. Grantees can go to these events, but there are fewer grants.

The effect is to cut down on how NASA scientists and contractors can interact with their foreign colleagues. The point is that there are a lot of difficult reporting requirements placed on NASA by OMB, and there is a tier level of conferences that addresses numbers and approvals. However, there are OMB memoranda stating that the details should be published on their websites when the costs exceed $100,000.

There is also the issue that some NASA web data relating to travel cannot be accessed. In addition, people who enter the information do not face consequences for entering it incorrectly. For the American Geophysical Union (AGU) meeting last year, the person entering the data put in the wrong year, so all the travel was in error and had to be dealt with through an intervention. This is not efficient. The paperwork still promulgates the old instructions. So even though NASA management says the restrictions are no longer in place, that message has not gone to the contracting office, which then does not authorize travel that should be allowed. Those authorizing payment are not paying attention to instructions, or they have been told to ignore them, or NASA management has not gone to the trouble of dealing with the reporting issues.

Mr. Clarke said that this was addressed the previous week, but he did not know what was discussed. He said he would take it to Mr. Dan Woods. Dr. McNutt said that if it would help to have the paper trail, he had spent close to a week going through everything that was available and could provide it to Mr. Clarke. At the Applied Physics Lab (APL), which is running a number of critical SMD missions, many contractors are being told that they have been disenfranchised from their communities. He hears that the contracting officer says that they must get permission. The last version of that memo was 2014, the update came out 6 months later, and GSFC has refused to update the guidance. It puts the Agency in a bad position, but it is the Agency's problem.

Dr. Russell noted that he is on a NASA contract and GSFC gave him permission to travel. Dr. McNutt replied that Lockheed told him that they are ignoring it and will bill NASA. Dr. De Pontieu, who is from Lockheed, added that most of the company's solar people are limited. Dr. McNutt said that he has talked to people at Marshall Space Flight Center (MSFC) and other NASA centers. Someone determined a set of quotas for how many slots there are for each center for each foreign conference. No one can get the master list. This is not transparent and it does not

help to advance the Agency mission.

Dr. Desai said that this is percolating to subcontracts. One of his research scientists won a grant, and the policy has been implemented on a subcontract on that grant. It is getting worse. Dr. Tobiska reported a similar problem. Dr. Antiochos said that he has not been able to determine who at GSFC has which kind of control in this matter. Dr. McNutt explained that OMB is very clear that this applies to civil servants and IPAs. He spoke with an examiner at OMB, and she told him that NASA made up these requirements. He raised this with the chair of the NAC Science Committee, who did not have kind words about this situation. It would be great to be able to fix this without airing the Agency's dirty laundry. However, he believed that if an acceptable resolution is not forthcoming, HPS should move in that direction.

Dr. Dahlburg said that HPS would deem this an internal discussion for the time being, rather than a finding, in order to give Mr. Clarke an opportunity to discuss the issue with SMD.

Theory Program
Dr. Angelopoulos said that HPS should state that, in order to progress, there is a need for modeling and theory to proceed, and that NASA should join forces with NSF. The field requires constructs to explain new data. Dr. Newmark said that this dialogue has begun at a high level, but neither agency can afford the $2 million annual costs of the centers recommended in the DS. It might be possible to start smaller. Dr. Guhathakurta said that it would be important to identify topics. The door is open, and the community can figure out the synergies. Dr. Angelopoulos said that NSF has already identified such interests, for example through its Geospace Environment Modeling Focus Groups. Mr. Clarke said that he will have regular meetings with NSF. Dr. Dahlburg asked the HPS members to think further about this topic.

Refereeing of Proposals
On the topic of the quality of refereeing, Dr. De Pontieu said the he raised this issue because he hears community disgruntlement. It is hard to find qualified referees. He understood that the Planetary Science Division (PSD) was looking at how to do this. Dr. Liemohn explained that PSD reorganized its R&A program, which resulted in hundreds of proposals in the Solar System Workings (SSW) area. In order to address that, the Step 1 proposals are assigned to one of two Step 2 groups; they cannot switch. The funds are split evenly between the two groups. One aim in this is to alleviate the difficulty in finding reviewers.

Dr. De Pontieu cautioned that low acceptance rates and mediocre refereeing raise the risk of losing valuable people from the field. When funding goes down, the interesting work outside the norm does not receive as much funding. More qualified referees might better discern the value of a risky proposal.

Dr. McNutt said that he is involved in PSD. There is a lot of bad will in the community about this new system. The idea was to fund projects along science lines and consolidate programs. What happened was that SSW ended up with many more proposals than expected, and people who had previously had higher acceptance rates were facing lower rates. As part of this transition, some of which was about the headquarters workload, there was an additional period where they were at risk of being unfunded. The transition has been problematic. Dr. De Pontieu observed that it sounded like the issue was mostly a huge program. Mr. Clarke said that he would discuss this with the PSD Director, Dr. James Green.

Dr. Newmark noted that a number of proposals with issues were on the technology side, where it is harder to staff panels. Dr. McNutt said that journal editors are also having issues with finding

good people to referee papers. There is a shrinking base that is a factor in the shrinking acceptance rate. People cut back on their volunteer work if they think they should put more effort into writing more proposals. The community is close to going below critical mass.

Dr. Posner said that there have been sounding rocket proposals with up to 40 co-investigators (co-Is). His concern is if split reviews are done sequentially, they might overlap with the upcoming ROSES announcement. Regarding feedback, Dr. Kessel said that that is done for missions, but the summary should include everything in the reviews, minus the redundancy and with some language changes in order in order to be consistent. Dr. Newmark said that HPD needs to communicate that proposals are assumed to start in the middle and go up or down, not start at excellent and go down. Dr. Kessel explained that panelists usually review six proposals, three as primary reviewer and three as secondary. Panels receive a maximum of 25 reviews, and the areas are sorted into panels by subfield.

Dr. Murphy said that if HPD made Step 1 binding, the Step 2s would have a greater chance of being funded. Dr. Morrill said that this would require feedback in Step 1. Dr. Kessel added that this could not be implemented before the 2016 ROSES call. Dr. De Pontieu pointed out that Step 1 is the source of the worst refereeing, as there is no panel discussion. Making it binding would not address the quality of refereeing. Dr. Tobiska said that he previously thought Step 1 should not be binding, but structuring it as a gate could be useful. The panel needs to be convinced that a proposed activity could produce compelling science, all within three pages. Dr. Elliott said that it might also mean that something important and useful will not look exciting and compelling.

Dr. Kessel pointed out that having a panel for Step 1 would not save any time, as it calls for additional senior people. Dr. Newmark noted that if Step 1 were binding, HPD would have to provide feedback, which is not required with the encourage/discourage decision. There is also a need for Division review of feedback. Dr. Liemohn said that another year of the current two-step process should continue; others agreed. He added that in the subpanels, he would hope that most people would be able to move beyond granularity.

Dr. Dalhburg asked Drs. Elliott and De Pontieu to take the lead in discussion about what they heard from the community, so that the Subcommittee could consider the issue further the next day. She wanted to identify the issue more precisely. Dr. De Pontieu noted that while the complaints have not been quantified, they are common. Mr. Clarke said that HPD is not getting those comments, though Dr. Newmark pointed out that some had come in on the technology side. Dr. Elliott explained that when proposers have an issue, they do not want to call it to NASA's attention because they do not want to be penalized in the future.

Adjourn

The meeting was adjourned for the day at 4:51 p.m.

Wednesday, July 1, 2015

Recap/Plan for Day

Dr. Dalhburg said that HPS would discuss proposal reviews as a finding or recommendation, clarifying the Step 1 part of the process. Dr. Antiochos would lead a discussion on differentiating GI and SR language. The risk and risk aversion discussion might warrant a finding, as might the topics of collaboration and Dr. Angelopoulos's idea on launch capabilities. Dr. Russell said that the HPD website compared to those of other SMD divisions might be an internal point to discuss.

Dr. Elliott reported that she is working with Dr. De Pontieu on the proposals topic, noting that R&A is critical to HPD, the lack of funding creates strain, and recent reviews seem to be problematic. A short survey might provide data in that regard. Reviews would benefit from additional technical reviewers. HPD may need to use Step 1 as a downselect for Step 2. Dr. Dahlburg suggested that HPS might recommend clarification of Step 1 criteria.

Dr. Kessel explained that the next HPS meeting will be face-to-face and primarily address the Government Performance and Results Act Modernization Act (GPRAMA) evaluation.

Airborne Observations Opportunities

Dr. David Pierce, SMD Senior Program Executive for Suborbital Research, discussed how to request and use the Directorate's various suborbital assets. Over the last few years, SMD has integrated all of the suborbital elements into the Suborbital Research Program, with parts of the Program funded throughout the Divisions.

The Program supports technologies and precursor technologies, develops capabilities, and promotes science, technology, engineering, and math (STEM) education. The Airborne Program (ASP) is housed within ESD and conducts global aircraft investigations in support of the Earth science community. A principal investigator (PI) may need a small number of hours of flight in order to gather the information needed to submit a ROSES proposal, and ASP handles that. The flights will go up to 21km and last as long as 30 hours. ASP does up to 20 campaigns each year, going through various NASA aircraft offices at the centers. Mission support includes mission management and engineering. The Program will cut holes in aircraft if needed.

Dr. Pierce presented an overview of aircraft capabilities at the centers. The Program can make things happen, and will even discuss things like flying into a thunderstorm, which pilots would rather avoid. The primary considerations are the baseline requirements, the threshold, and which aircraft will best support that. There are six core aircraft. These are heavily subscribed, but investigators should call to request time and learn their options. When altering an aircraft for an activity, ASP makes it in such a way that the new configuration can be used again or the aircraft can be patched. Some of the aircraft can also carry pods under their wings. Aircraft specifications are available online.

Maps of the 2005-2014 airborne campaigns and deployments indicate the Program's global reach. Dr. Pierce presented details of the P-3 Orion in order to demonstrate the types of mountings, ports, and bubbles that are possible. The Orion can fly to 30,000 feet and can stay up for 14 hours. Scientists can accompany these flights, as the Orion has about 20 science seats.

The DC-8 is the premiere flying lab, going up to 45,000 feet. It is a long-duration aircraft with many ports that is often used for remote sensing and instrument calibration, in addition to Earth science. The WB-57 flies over 60,000 feet and is good for high altitude instrumentation. It has similar pods and payload bays to the ER-2. There are no standard payload constraints; ASP will design to user needs. Global Hawks operated globally, with high endurance and many instrumentation options. C-130s have a large payload capacity. The King Air B-200 is often used for sounding rocket missions. Finally, the C-23 Sherpa can do a short test flight to evaluate instrumentation.

Investigators can request a flight through the Science Operations Flight Request System (SOFRS), which provides a concierge-type service. An investigator would work with the aircraft manager to determine what the flight needs and what it would cost. Those costs then go into the ROSES proposal. The costs vary by aircraft.

MMS Update/GI Funding

Dr. William Paterson of NASA reported that MMS is working quite well. All instruments have been activated and are running in science mode. There was a conjunction with the Van Allen Probes, which allowed calibration. In addition, the plasma instrument commissioning activity occurred during a large storm, which was interesting. The plasma data look quite good. The mission team can only bring down a fraction of all data, so there are systems on MMS to select the most important data, computing a figure of merit. This can be adjusted as needed.

There is a back-up scientist on the ground who reviews the data summary and helps determine what ought to be selected. The scientist in the loop (SITL), as it is called, is a rotating position from the various instrument teams. The PI has the authority to override the position. The automated system can be tuned, and the SITL can identify things that the automated system might miss. Burst data are available for a couple of orbits, allowing time to evaluate. The SITL is an addition for fine-tuning selection. There may be observing campaigns during the extended mission, but not during the nominal mission.

The Guest Investigator (GI) program reflects a couple of setbacks that the mission had last year. There was an open call that did not include MMS. This call drew 202 Step 1 proposals, for which HPD recruited 62 reviewers to provide encourage/discourage decisions with brief explanations. Dr. Paterson said that he feels a reviewer can identify a proposal's weaknesses in the three pages of Step 1. He expected the percentage of awards to be similar to that of the previous year. Reviewers were asked to encourage about half of the proposals, focusing on those that seem to have a chance at being funded. About 70 percent of the proposals were encouraged, however. The due date for Step 2 was pushed back to July 31 to allow 30 days between the Step 1 notification and the Step 2 submission. The later due date has no impact on the Step 2 decision timeline.

HPD substantially altered the language for GI in ROSES this year, borrowing much from APD:

> *"In support of any H-GI proposal, investigations may employ theory, models, and data from other sources, as needed to interpret and analyze NASA's HSO data, but only as a secondary emphasis. However, in any such instance, the proposal must clearly demonstrate that the theory, models, and/or data in question are necessary for interpretation of the HSO data, and are not themselves the primary object of the investigation. Development of new models and theories is not solicited."*

This seems to have worked to keep the SR proposals out of the GI area. It is ambiguous in order to give the Division some latitude.

In answer to a question, Dr. Newmark explained that the Drive initiative began in FY15, though the increase was small; most of it went to the GI program. HPD was able to get a lot of funding out to the community, but the 3-year grants have the effect of allowing fewer new starts in FY16. Drive will be much larger in FY18, with a $30 million augmentation; there will be a $40 million augmentation in FY19.

Dr. Paterson listed potential MMS/GI scenarios. ROSES 16 should have a fully open GI line, in his opinion, as it would allow proposal pressure to determine the relative funding for MMS-related research. In ROSES 17, he would like to see a special call for MMS alone or in combination with other select missions, based on the ROSES 16 response. If the GI program is overwhelmed by MMS proposals, that would warrant a separate call and funds set aside so that MMS does not overwhelm the R&A program and result in funding only MMS proposals.

Dr. Antiochos stated that he disagreed completely. MMS represents an investment of over $1 billion and, therefore, it must be a success, one that elevates HPD. The Division should want the community to use MMS data to maximize the mission. He would ask for a GI program as early as possible. Dr. Paterson replied that if HPD put it out before people can look at the data, it would affect the quality of the program. Dr. Kessel added that it does not leave a lot of time for anyone outside of the program to learn the data. Dr. Antiochos said that he understood, but he anticipated that a separate call will be needed in ROSES 17.

Dr. Angelopoulos pointed out that MMS has substantial PI funding already, so the question is whether to bring in more of the community from the GI program or from MMS itself. This may call for discussion. The big proposal rush comes in for the new missions, which means there could be too many MMS proposals, stressing an R&A program that is already limited.

Dr. Paterson said that the GI program was originally meant to support scientists outside of the project. Then it began to serve those inside the mission. He would like to see a specific strategy. In addition, MMS has three teams for interdisciplinary science that are not funded directly through the project. In FY17, these teams will be looking for more funding.

Turbulence Heating ObserveR (THOR) – ESA M4 Mission

Dr. Angelopoulos recused himself from this part of the meeting due to his status as a member of the THOR team.

Dr. Stuart Bale of the University of California at Berkeley explained that THOR was proposed to ESA in order to explore how plasma heating and energization occurs in space turbulence. It is the first dedicated turbulence microphysics mission. It will address three questions:

- How is plasma heated and particles accelerated?
- How is the dissipated energy partitioned?
- How does dissipation operate in different regimes of turbulence?

THOR has been proposed in various incarnations since 2007. In 2014, ESA finally down-selected it as one of three missions for a phase 0/A study. When that proposal was submitted to ESA, HPD provided a letter of support. The final selection will take place after the spring of 2017.

THOR relates to DS goals by looking at kinetic scales in plasma turbulence. Much of this work has been done in the spectral domain, but the time scales are short. That leads to the question of what is occurring at the scale of smaller particles. Electric field data hint at this, but they come with a great deal of noise, which THOR would eliminate.

The mission will have three phases during its 3 years of primary operations. Two years of extended operations are also in the plan. The spacecraft concept, which was developed in Sweden, will be further refined. It benefits from a sun-pointer and a slow spinner. Teams were proposed with the instruments.

The science study team is forming now, and ESA would like to see an expression of interest from NASA for Phase A. There is room for new instruments, as the Europeans tend to propose more than they use. ESA is aware of NASA's plans for various research calls.

HPS Discussion

Dr. Antiochos felt that the field had not evolved in 35 years regarding proposals. He agreed to work with Drs. Elliott, De Pontieu, and Liemohn on the finding about the quality of refereeing. On the topic of risk and risk aversion, Dr. Dalhburg asked Dr. McNutt to prepare a draft finding;

the Subcommittee would decide later whether or not to move ahead with it. Dr. Tobiska agreed to draft a finding on collaboration; and, Dr. Angelopoulos would redraft a fueled payload finding along with Dr. Murphy.

Dr. Antiochos asked what HPS wanted the SR program to do, within the limits of HPD resources. It was agreed that HPS would ask for clarification of Step 1 guidelines. Dr. Morrill noted the selection rate of the proposals that were discouraged in Step 1 and submitted in Step 2. Fifteen percent of all selected proposals had been discouraged. Dr. Dalhburg said that that spoke to a need to make the Step 1 criteria crisper. Dr. Newmark said that it could also be that the discouraged PIs did not care about Step 1 and were going to propose in Step 2 regardless. They might also have worked harder on Step 2. The causes remain unknown. Dr. Desai agreed to lead this discussion.

Interstellar Probe (ISP)

Dr. McNutt talked about the ISP, an idea that goes back to 1971, when it addressed solar wind. Since then, it has been the topic of various papers and NASA studies. The ISP has been in the HPD roadmap, but it is always been deferred to the next decade.

In September 2014, the Keck Institute of Space Studies (KISS) held workshops on exploration of the interstellar medium (ISM). The workshop goals were a capabilities push and a science pull. The capability push sought to reduce the ISM travel time from Earth. The science pull will come from compelling science goals, science being done on the way to the ISM, and visiting a large Kuiper belt object (KBO). Heliophysics questions now constitute a piece of the science. The KISS workshop determined that there is compelling science en route to, at, and from the ISM. The workshop also identified a number of key heliophysics and astrophysics science questions. Science from the ISM would encompass radio science, solar gravity lens focus, and exoplanet and KBO detection.

There have been ISP payloads developed over the years. The resource requirements sound daunting, but advanced technologies such as CubeSats, with their reduced mass, might be more capable. There are physics limits related to distance. Dr. McNutt gave an example of a plot comparing a trajectory with a gravity assist from Jupiter and a trajectory with no gravity assist. The speed goal is extremely high, over 50 km/sec. JPL studied a very large nuclear electrical propulsion (NEP) system, which had flaws but was a good first try. Other concepts include a solar sail, which is smaller and would involve a close loop to the sun. A comparison of four notional approaches indicates that as performance increases, difficulty grows. Launch vehicle energy will be a factor.

JPL recently developed a set of reference mission goals. It became evident that this would be more complicated than the team thought when they first began. For a mission leaving Earth in 2027, it would take about 6 years to get to perihelion, which is about the same as a Jupiter assist. It would be several times faster from then on. The problem is that there is a critical maneuver that cannot be tested.

Some hardware already exists, but some must be developed. Enabling technologies for the mission will require a radioisotope thermoelectric generator (RTG) power source, low-power spacecraft systems and operations, miniaturized instruments, telecommunications, autonomy, and more. Investigators are converging on a notion of how to realistically carry out this mission.

HPS Working Time to Develop Findings

The Subcommittee members spent time developing their potential findings.

Discussion, Including Future Meeting Dates, Potential Agenda Topics, and Action Items
Dr. Dalhburg reviewed the drafts. First was a statement welcoming Mr. Clarke, offering congratulations on the success of MMS, and thanking HPD staff. She noted that the Subcommittee also had verbal comments for Mr. Clarke in four different areas, as well as the findings. Mr. Clarke was already aware of the travel issues. She thought that the only issue requiring further work was the HPD website. For the briefing to HPD, HPS would present comments on PAFs, risk, collaboration, and proposal issues.

Dr. Angelopoulos said that the PAF finding was modified in the area of the reason for the finding. Dr. Liemohn added that the recommendation was that NASA approve PAFs as an option. Dr. Kessel urged the team to simplify their message. Others agreed. Dr. Newmark suggested restating the finding to say that NASA should offer the cost of a fueled secondary payload as part of the Agency's launch services.

Dr. McNutt said that on the risk and cost of risk aversion finding, he raised three questions: what is the current state of the art versus history, what is an appropriate review scope and frequency, and when is system engineering real engineering and when is it just checking boxes? There is the perception of needing to lower the risk down to almost zero. He wondered about the extent to which the official NASA risk documents are adhered to and applied, or the extent to which they are being over-interpreted. It would also be interesting to get some data on whether expensive projects are being reviewed disproportionately. Each review costs $50-100,000, funds that could go to supporting a number of SMEXes, for example. Dr. Dahlburg said that she recommended taking this to the NAC.

Dr. Kessel suggested that the finding should be about collecting the data, and Dr. Elliott agreed that they would have a stronger case if data were collected and the finding was less anecdotal. Dr. Dahlburg restated the finding to note that there is a perception of excessive scrutiny, and therefore data are necessary. Dr. McNutt added that there is also a need for feedback on the implementation of the guiding documents. Dr. Dahlburg expressed a preference for not dealing with NPR documents, but rather simply asking for data from as many projects as possible to determine if there is anything behind the perception of excessive reviewing, especially for the more expensive projects. Dr. McNutt agreed.

On the collaborations topic, Dr. Tobiska said that the draft finding was that HPD ROSES elements should explicitly require proposers to consider innovative uses of cost-savings collaborations as appropriate. Future scientific research to understand the heliosphere will require advanced instruments, new measurements, cutting edge modeling, and innovative mission concepts. It was suggested that he change "require" to "encourage." Dr. Guhathakurta thought the finding should encourage the program scientists to promote these opportunities, not the community. After some discussion, it was agreed to hold this issue and discuss it further at the next HPS meeting.

Dr. Angelopoulos read his revised finding, which stated that NASA should explicitly offer the use of fueled PAFs as part of launch services, or enable the use of such capabilities by the proposers outside of the cost cap. The HPS members agreed that this should go forward.

Dr. Elliott read the draft R&A finding, which stated that R&A funding is critical to the success of HPD. Lack of such funding and the resulting proposal pressure can potentially strain the review process. A simple short survey of both the proposers and panel reviewers for Step 1 and Step 2 proposals would help evaluate the overall quality of the review process. She then listed a number

of questions for proposers and reviewers. Dr. Liemohn suggested that the survey include scales instead of yes/no binary options, as well as an open box for comments. He described how AGU automatically conducts a systematic survey that has proven helpful. He offered to provide the AGU survey questions as examples.

Dr. Antiochos read a draft recommendation that HPD should either increase the size of the grants to bring them more in line with their values of 30 years ago and/or reduce the number of pages from 15 to 10 or less for the scientific/technical/management section for R&A proposals. He noted that there are limited resources and a low success rate, so it probably makes the most sense to decrease the size of the proposals. After some discussion, Dr. Dahlburg pointed out that there were two separate thoughts here: reducing the number of pages and increasing the size of the grants. She recommended sticking with the former, though Dr. Angelopoulos cautioned that the unintended consequence of fewer pages is more proposals.

In a vote on this recommendation, Dr. Angelopoulos was the sole vote against it; all other HPS members voted in favor of it.

Debrief with Heliophysics Director

Dr. Dahlburg read the statement of appreciation, which noted Dr. Grunsfeld's statement about the importance of HPD and which affirmed that HPS was pleased to have Mr. Clarke in the Division Director position. The statement also conveyed the Subcommittee's appreciation of his comments about HPD priorities and programs. HPS thanked Dr. Newmark and Ms. Smalley for their contributions. The statement congratulated the Division on the high SOAR recommendation and expressed pleasure at seeing how well MMS was proceeding. HPS also noted the exciting news about the Senior Review approving all missions for extension. Finally, the statement thanked all of the meeting presenters.

Next were a comment and three areas of input. Dr. Russell began by mentioning how the HPD website was not as strong as those of the other SMD divisions. Ms. Jenny Rumburg said that that is already being changed by SMD in order to make it accessible to a science audience as opposed to the general NASA website. This is SMD-wide.

Dr. Angelopoulos read the PAF finding that NASA should explicitly offer the use of fueled PAFs as part of launch services, or enable the use of such capabilities by the proposers outside of the cost cap. Mr. Clarke said that he would look at this issue.

Dr. McNutt said that the risk aversion issue keeps coming up in the community. He explained that there is a general perception by the science community that flight projects are over-reviewed. Associated questions involve the current state of the art versus historic information, the appropriate review scope and frequency, and systems engineering versus checklists. The recommendation is to collect data on the number of formal reviews for as many projects as possible, comparing these with the final development costs of those projects to determine if expensive projects are being reviewed excessively and if reviews are occurring at too high a cost-to-benefit ratio. The reviews have become increasingly formal, and while some of this may be necessary, there is concern in the community that it has become onerous. Mr. Clarke noted that this investigation will take time. Dr. Angelopoulos noted that while assembling the data could prove difficult, it could also resolve some cost issues.

Dr. Desai read the recommendation on reducing the number of proposal pages from 15 to 10 or less for the Scientific/Technical/Management Section for R&A proposals, and possibly increasing award size once DRIVE begins. Dr. Dahlburg thought it might be desirable to try the proposal

size-reduction concept on a small scale at first.

Dr. Elliott read the R&A feedback finding. Dr. Liemohn described the AGU survey that goes out after every acceptance and rejection. It is anonymous and provides space for comments. It serves a way to collect information. Dr. Elliott noted that some members of the community are reluctant to give NASA feedback more directly. Dr. Liemohn said that he would provide more information about the AGU survey at the next meeting.

Dr. Dalhburg summarized, noting that the PAF and page reduction findings would go forward to the NAC Science Committee.

Mr. Clarke thanked HPS members for their hard work and efforts. He encouraged them to contact him.

Adjourn
The meeting adjourned at 4 p.m.

Appendix A
Attendees

Heliophysics Subcommittee members
Jill P. Dahlburg, Naval Research Laboratory, Acting Vice Chair
Vassilis Angelopoulos, UCLA
Spiro Antiochos, NASA GSFC
Bart W. De Pontieu, Lockheed Martin
Mihir Desai, Southwest Research Institute
Heather A. Elliott, Southwest Research Institute
Michael W. Liemohn, University of Michigan
Ralph L. McNutt, Jr., Johns Hopkins University
Neil Murphy, Jet Propulsion Laboratory
James Russell III, Hampton University
W. Kent Tobiska, Space Environment Technologies
Ramona Kessel, NASA HQ, Executive Secretary

NASA Attendees
Marc Allen
Ralph Beaty
Eric Christian
Steven Clarke, HPD Director
Max Bernstein
T. Jens Feeley
Lika Guhathakurta
Jeffrey Hayes
Jennifer Hoh
Robert Leamon
John Lee
Michael G. Moore
Jeff Morrill
Jeffrey Newmark
William Paterson
David Pierce
Arik Posner
Jenny Rumburg
Sandra Smalley
Erin Smith
Elsayed Talaat
Geoffrey Yoder

Other Attendees
Stuart Bale, UCB
Dominick Conte, Millennium Space Systems
LaMont DiBiasi, SWRI
Michael Mirein, Congress SST
Amy Reis, Zantech
Elizabeth Sheley, Zantech IT
William S. Smith, Science Works

Audio
Louis Barbier
Steven Clark
Elsayed Talaat
John Grunsfeld
Grace Hu
Jennifer Kearns
James Lochner
David Pittman
Abigail Sheffer

Appendix B
Subcommittee Membership

Jill P. Dahlburg, Acting Vice Chair
Naval Research laboratory

Ramona Kessel (Executive Secretary)
NASA HQ

Dr. Vassilis Angelopoulos
UCLA

Dr. Spiro Antiochos
NASA GSFC

Bart W. De Pontieu
Lockheed Martin

Mihir I. Desai
Science and Engineering Division
Southwest Research Institute

Heather Elliott
Southwest Research Institute

Michael W. Liemohn
University of Michigan

Ralph L. McNutt, Jr.
Johns Hopkins University

Neil Murphy
Jet Propulsion Laboratory

James Russell III
Hampton University

Roger W. Smith

W. Kent Tobiska
Space Environment Technologies

Appendix C

Presentations

1. *Heliophysics Division Overview*, Steven Clark/Jeffrey Newmark
2. *Programmatic Overview*, Sandra Smalley
3. *Heliophysics Senior Review Briefing*, Jeffrey Hayes
4. *Solar Cycle Prediction, Short-term Solar Variability, and the Measurable Effects of That Variability throughout the Heliosphere*, Bob Leamon
5. *ROSES 2014 HTIDeS Selections*, Arik Posner, Jeff Morrill
6. *Airborne Observation Opportunities*, David Pierce
7. *MMS Update/GI Funding*, William Paterson
8. *THOR*, Stuart Bale
9. *Interstellar Probe*, Ralph McNutt

Appendix D
Agenda

Heliophysics Subcommittee Meeting
June 30 – July 1, 2015

Tuesday June 30; 6H41

9:00 Welcome, Overview of Agenda — J. Dahlburg, Acting HPS Vice Chair

9:10 SMD remarks / Introduction of new Heliophysics Director — G. Yoder, NASA HQ; J. Grunsfeld, NASA HQ

9:40 Heliophysics Division Overview — S. Clarke /J. Newmark, NASA HQ

10:45 BREAK

11:00 Flight Program Status — S. Smalley, NASA HQ

11:30 Senior Review Results — J. Hayes, NASA HQ

12:15 LUNCH: Science Presentation: Bob Leamon, *Solar cycle prediction, short-term solar variability and the measurable effects of that variability throughout the heliosphere*

1:30 Staffing needs of HPD — S. Clarke, NASA HQ

2:30 R&A program update/HTIDeS — A. Posner, J. Morrill, NASA HQ

3:30 BREAK

3:45 HPS discussion / working time to develop findings — Subcommittee

5:00 ADJOURN

Wednesday July 1: 6H41

9:00 Recap/plan for day	Acting HPS Vice Chair
9:15 Airborne observations opportunities	Dave Pierce/Bruce Tagg, NASA HQ
10:00 MMS Update/GI Funding	B. Paterson, NASA HQ
10:30 THOR – ESA M4 mission	S. Bale, UCB, C. Pollock, GSFC
11:15 Interstellar Probe	Ralph McNutt/APL

12:00 LUNCH

1:15 HPS working time to develop findings	Subcommittee
3:15 Discussion, including future meeting dates, potential agenda topics, action items	Subcommittee
3:30 Debrief with Heliophysics Director	S. Clarke, NASA HQ

4:00 ADJOURN